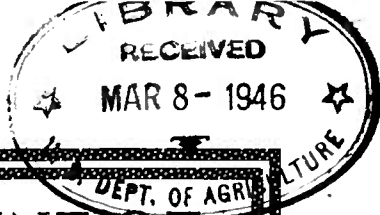


Historic, archived document

Do not assume content reflects current scientific knowledge, policies, or practices.

1
ag84F
cop. 3



U. S. DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN No. 1660

The USE of LOGS *and* POLES IN FARM CONSTRUCTION



LOG-HOUSE CONSTRUCTION was well understood by the pioneers, but like other primitive arts with a simple technique, its principles are not so well known to the general public of to-day.

This type of building is adaptable to both temporary and permanent shelters for man and beast in those sections of the country where cut-over land is being brought into cultivation and in other localities where timber is readily available. In such regions a farmer just starting out can construct of logs and poles nearly all the shelters and many conveniences needed for his immediate use, thus obtaining a comfortable temporary home with the expenditure of little money and conserving his capital for the development of the farm and the building of a permanent home later.

The demand for information on the construction of log cabins and rustic work indicates renewed appreciation of the art and a desire for directions for utilizing logs and poles.

Washington, D. C.

Issued March 1931
Slightly revised April 1935

THE USE OF LOGS AND POLES IN FARM CONSTRUCTION

By T. A. H. MILLER, *Agricultural Engineer, Bureau of Agricultural Engineering*

CONTENTS

| | Page | | Page |
|--------------------------------------|------|----------------------------|------|
| Introduction..... | 1 | Methods of using logs..... | 5 |
| Selecting trees for logs..... | 1 | Notching..... | 8 |
| The survey..... | 1 | Chinking and caulking..... | 9 |
| Suitable species..... | 2 | Construction..... | 10 |
| Size of logs..... | 2 | Pole houses..... | 10 |
| Time of cutting..... | 2 | Log houses..... | 11 |
| Protection of logs from insects..... | 3 | Other uses of logs..... | 21 |
| Choice of site..... | 3 | | |

INTRODUCTION

LOGS AND POLES can be employed advantageously in the building of dwellings and other farm conveniences, by settlers or others establishing themselves in regions where timber is plentiful. This method of construction, in that it permits of utilizing local material and labor, saves capital for the development of the farm and the building of a permanent home later.

The principles of log construction are few and simple. However, they are not well understood by the general public of to-day. This bulletin outlines the chief points to be observed in building with logs and poles, and it is believed that one should have little difficulty in planning an attractive home and certain other useful structures after studying the text and illustrations.

SELECTING TREES FOR LOGS

THE SURVEY

Before starting construction, a thorough survey of the wood lot should be made to determine the number, species, and size of trees available and their sale value. Many species of trees have commercial value¹ which warrants their being left standing until convenient to market. By following this procedure considerable money might be available later for defraying the expense of building, or for other purposes; also, such a survey will be of help in determining the design of the proposed structure.

¹ See Farmers' Bulletin 1117, *Forestry and Farm Income*; Farmers' Bulletin 1210, *Measuring and Marketing Farm Timber*.

SUITABLE SPECIES

As a matter of economy one should as far as practicable use the trees found on the site. When a choice of species is possible balsam, hemlock, tamarack, and pine are very good. Short-lived woods like the cottonwood, willow, aspen, birch, and basswood, unless very thoroughly protected from dampness are not so suitable. Cedar and white pine are excellent when it is not possible to market them. Many of the hardwoods are almost as desirable but are less frequently used, chiefly on account of their weight and hardness. Other species can be used, but it is advisable to choose the more durable woods and for the sake of appearance to employ the same species in like parts of the building.

SIZE OF LOGS

Logs of from 4 to 10 inches in diameter are usually employed, yet larger logs are not uncommon and it is desirable, though not essential, that the logs have only a slight taper. The length of the logs should preferably be a little greater than the length of a room, to allow for intermembering; tree trunks longer than 20 feet are heavy and difficult to handle, and longer ones are seldom necessary since the length of a room does not often exceed 20 feet. While logs used in a wall can be spliced by halving the abutting ends, this is not considered good practice as it weakens the wall and detracts from the appearance. Short lengths can be utilized for panels between wall openings, as explained on page 14. By careful designing, details can be worked into a structure so as to make use of a large number of short lengths of small-diameter logs, thus utilizing to advantage a limited supply of timber and at the same time effecting a saving in the large trees and in the amount of labor required in building.

TIME OF CUTTING

If the logs are to be peeled, winter is the best time for felling the trees, for if felled in the spring while the sap is running, the logs deteriorate on account of the development of stain and decay organisms. Department Circular 421, *The Control of Stain, Decay, and Other Seasoning Defects in Red Gum*, describes resisting treatments which also minimize end checking. Bark will adhere to the logs if the trees are cut in the late summer, but to avoid insect injury the cutting should be postponed until about the time of the first frost. To increase the adhesion of the bark, a narrow strip or score should be cut off on two sides of the entire length. The logs should then be seasoned by piling them in the shade so as to allow thorough circulation of air, until the following spring or summer. The scores, ends, and knots should be painted with coal-tar creosote a few days after the trees are felled and again just before the timbers are used. When not scored as suggested, the bark should be tacked to the logs with large-headed nails, using one to every square foot of surface. Sometimes the bark is nailed on without particular attention to the time of cutting or other treatment.

Unpeeled logs have a more attractive appearance than peeled logs, but there is no practical advantage in keeping the bark on the logs.

In fact, peeled logs are to be recommended for the more permanent structures since they are less subject to rotting and can be better protected against insect attack. Sometimes logs are stained, creosoted, or painted. Staining is probably to be preferred, for the odor of creosote, which is rather persistent and penetrating, is objectionable in a dwelling. Even though the logs are not painted, it is advisable to apply a protective coating to the cuts made by notching at the corners. This is especially recommended when bark is to be kept on the logs.

PROTECTION OF LOGS FROM INSECTS

Woods cut at certain seasons of the year are subject to attack by beetles which fill the bark with holes, causing sawdustlike borings to fall out and lodge on the wood. The larvae or grubs of wood-boring beetles mine the inner bark, causing the outer bark to loosen and fall off; and they bore into the sapwood and sometimes the heartwood of the logs, making large holes and often reducing them almost to dust within a few months, before the wood becomes well seasoned. Methods of reducing injury to poles by insects have been developed by the Bureau of Entomology. Before cutting logs, the recommendations of that bureau² should be studied thoroughly, as considerable trouble after the logs have been used in a structure may thus be avoided.

CHOICE OF SITE

In general, a site should be chosen for its suitability for the main purpose, good water and drainage, accessibility, and orientation. The settler is principally concerned with the adaptability of the site to the final plan of his farmstead, and he therefore should not locate the temporary log buildings on the exact spot on which he proposes to place his permanent structures, but should so locate them that they can be utilized in the final layout either as wings of a new building or as separate structures. Farmers' Bulletin 1132, Planning the Farmstead, discusses the location of the farmstead with regard to the fields and also the relation of buildings one to another with respect to efficiency in the performance of routine operations.

A dwelling always should be located on a well-drained spot and so oriented that advantage may be taken of restful vistas, cooling summer breezes, and protection from storms. Discretion should be exercised in preparing the site, for the indiscriminate altering of the topography or the ruthless cutting of trees in the immediate vicinity of the structure may rob the site of much of its natural charm and leave the surroundings bare and uninteresting. Frequently shrubbery can be transplanted so as better to fit into the proposed scheme of landscaping.

In selecting the site, the builder of a new home should give consideration to the foregoing suggestions relative to attractive surroundings for they frequently serve in some measure to compensate the housewife for the denial of comforts which is sometimes inevitable in the first years of the struggle to establish a new home.

² Farmers' Bulletin 1582, Protection of Log Cabins, Rustic Work, and Unseasoned Wood from Injurious Insects; Farmers Bulletin 1472, Preventing Damage by Termites or White Ants.



FIGURE 1.—The long wings and large porches suggest a clubhouse. Note the use of small poles for closing-in under the porch and the screened-in porch which provides a large room with the use of very little material



FIGURE 2.—The plainness of this cabin is accentuated by the bareness of its location. Generally, large hewn logs of chestnut or oak were used in building cabins in the Eastern States, a fact which accounts for the long life of the structures. Note the type of corner joint typical of this region and the method of extending the second-story floor joists through the walls

Farmers' Bulletin 1087, *Beautifying the Farmstead*, contains suggestions that will be found useful in this connection.

Much of the pleasure of living in a log house built for recreational use is dependent upon the site; therefore, if a choice of sites can be had, consideration should be given to accessibility to a main road. Side roads are likely to become almost impassable at times, making travel and conveyance of supplies very difficult. While a secluded spot may be desirable, its advantages often are lessened if access is difficult.



FIGURE 3.—An unusual design which is shown here on account of the details illustrated

METHODS OF USING LOGS

Log construction permits of a wide range of treatment and may be made very attractive. However, the design should suggest the general purpose of the building. (Fig. 1.)

In style, the log house varies from the severely plain hewn-log cabin (fig. 2) to elaborate creations often displaying considerable originality (fig. 3). Perhaps the most fruitful sources of suggestion,

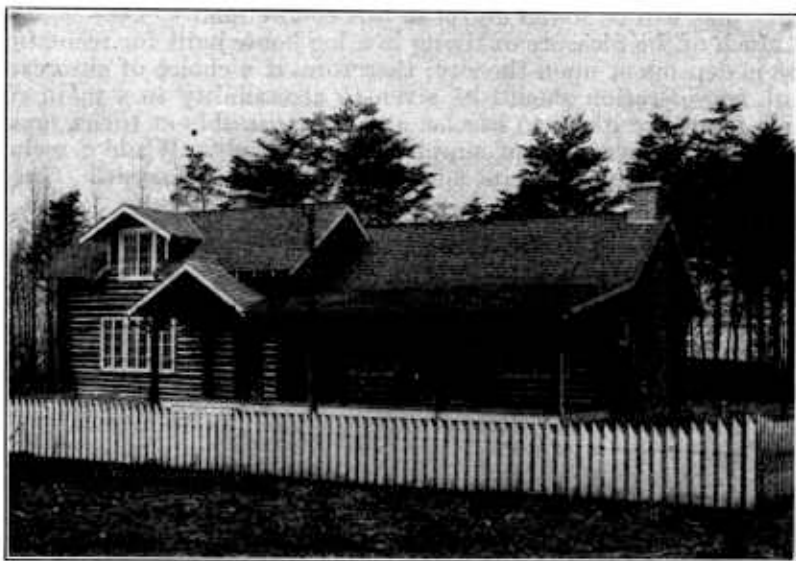


FIGURE 4.—A carefully built farmhouse, with 6-inch logs laid horizontally. Colored mortar might have been used for the chinking



FIGURE 5.—An example of neat pole work. Sufficient precaution has not been taken to prevent rotting of lumber in the lower portion of the structure. The rear should be raised clear of the ground and ventilation openings provided in the tight shingle inclosure around the foundations

as to the effective use of logs, are photographs of structures that have been built. A large number of pictures are used in this bulletin to illustrate methods of employing logs. While some of the designs shown may appear rather ambitious, yet their execution requires only a little extra labor and material at practically no additional cost. Prospective builders will do well to study these illustrations and make use of the suggestions, thus obtaining a better appearing house than they might otherwise consider to be within their reach.

There are two general methods of using logs in walls, the most usual one being that in which they are placed horizontally (fig. 4), and the other where they are set vertically (fig. 5). Sometimes a combination of the two methods is used in the same structure, (fig. 6), and frequently poles are used only for the frame of a building (fig. 7).

Where the logs are laid horizontally the appearance of the walls is materially affected by the size of the logs, the method of working them, and the type of joint used for intermembering. If a rustic



FIGURE 6.—An easily built structure. Logs are used vertically between windows and horizontally at the openings

effect is desired, round logs are selected and care is taken to preserve the bark. Neatness of appearance is attained by using logs of uniform diameter and taper. (Fig. 4.) A pleasing variation is obtained when the logs decrease uniformly in diameter from the foundation to the plate so as to produce a batter to the walls. Substantiality is suggested by heavy logs (fig. 8) and ruggedness by logs which are irregular. Frequently logs are hewn on two, three, or four sides and if of large diameter they can be hewn to a thickness of from 8 to 12 inches and laid with the wide face vertical. In some sections the logs are flattened slightly at top and bottom so that the upper ones bear upon the lower ones throughout their lengths, while frequently they are laid with an intervening space of from a fraction of an inch to one almost equal to the diameter of the log. The space between the logs is determined by the depth of the notch at the corner where logs of adjacent walls intermember. If the logs

are hewn so as to fit quite closely, the building will have a substantial appearance and considerable labor in caulking and chinking will be saved.



FIGURE 7.—The 4-inch poles of this 24 by 27 foot house were peeled and erected by one man in three days. (Courtesy of the Michigan Agricultural College)



FIGURE 8.—Very substantial cottages; note the corner joint employed and the method of building the casement window to permit the sash being opened out flat against the wall

NOTCHING

Various methods are used for intermembering and terminating the logs at the corners. A number of the cuts and notches are illustrated in Figure 9; other types are clearly shown in the photographs. The sketch in left center of Figure 9 shows the detail

used for the corners of the house illustrated in Figure 10 which differs radically from pioneer methods. The ends may be left irregular, sawed off vertically, or sawed on a batter so that the base log has the greatest projection and the plate log the least. (Fig.11.) The cracks or spaces between the logs must be sealed, but this

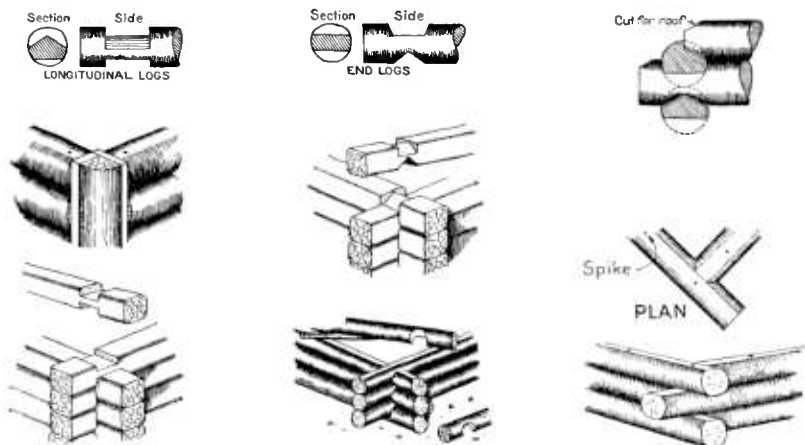


FIGURE 9.—Methods of cutting and notching logs for corners

operation should be delayed as long as it is practicable so that the logs will have an opportunity to dry out or season.

CHINKING AND CAULKING

If the joints are laid close, the narrow cracks may be caulked with cotton waste, oakum, or sphagnum moss—the moss found in swamps



FIGURE 10.—The corner logs of this house are not intermembered

and used by florists for wrapping plant roots. This is forced into the joints from both sides of the logs with a wooden wedge or a caulking iron struck with a mallet. If the joints are wide, they may be closed with short lengths of quartered logs shaped to fit the cracks,

bedded in mortar, and nailed in place. (Fig. 12). To assure watertight walls it frequently is necessary to insert chinks both inside and outside and then to plaster over them with mortar. Sometimes nails are driven into the logs with heads protruding to form a key for cement mortar which may be used for stopping joints that are not too wide. Where the logs have been laid in crib fashion, the spaces are filled with clay, lime mortar, cement mortar, or pieces of slab stone laid at an angle of 45° to 60° and bedded in mortar, thus causing the wall to appear as alternate layers of masonry and timber. Farmers' Bulletin 1772, *Use of Concrete on the Farm*, describes how to make a good 1-to-3 mortar such as is suitable for filling in and for bedding slab stone. Before filling wide spaces between the logs



FIGURE 11.—Logs vary uniformly in size from base to plate and cut off on a batter. Rear piers should be higher than shown here in order to keep logs off the ground

with mortar, narrow strips of expanded metal should be fitted and securely nailed between the logs to serve as reinforcement and as a background for the mortar. Clay for chinking is mixed like mortar, to the consistency of putty and pushed into the joints. When well done clay chinking will last from 10 to 12 years and may be used as a temporary filling for minor farm buildings.

CONSTRUCTION

POLE HOUSES

Buildings with walls made by placing logs on end (fig. 5) are commonly referred to as pole houses. Such structures are easier to build than those in which the logs are horizontal because one man can handle the logs which generally are of short length and small diameter. Moreover, the labor of notching at the corners is not required.

This use of logs is admirably suited to small buildings and lends itself to considerable variation in architectural expression. However, such structures are not so substantial as log houses. The poles should not be less than 4 to 5 inches in diameter and if of uniform

diameter and taper they produce a neat effect. If a weather-tight wall is desired, the logs should be hewn on the sides and matched to fit closely. The cracks are chinked in the same manner as in log houses. A good foundation should be provided upon which should be bolted square sill logs equal in diameter or hewn dimension to that of the wall poles. The top surface of the sill must be smooth and level to provide proper bearing for the sawed ends of the poles. Similar logs must be used for plates over the tops of the verticals. The sills and plates should be halved and lapped at the corners. The corner uprights should be set first and the plates then placed on top of them. The wall uprights are then matched and fitted between the sills and plates and spiked in place. Other details are executed in a manner similar to that described for log houses.

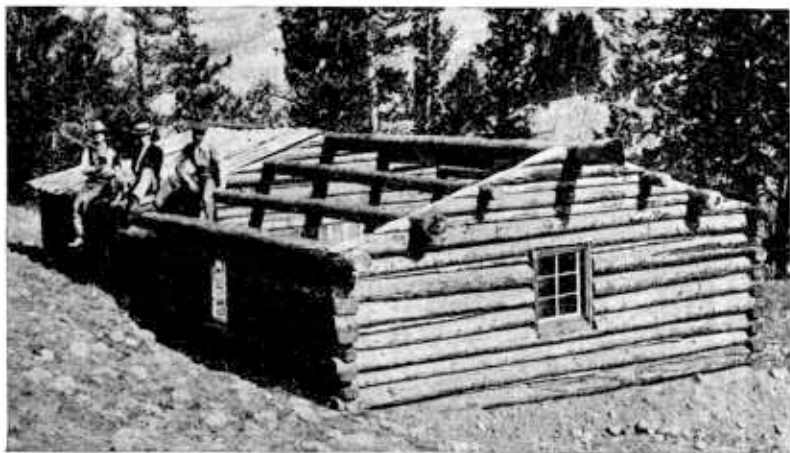


FIGURE 12.—Note the chinking between logs and the method of forming gables with horizontal logs. The location of this house is unfortunate as the hillside drains water onto the site. Also the bottom logs are in contact with the ground; unless the site is carefully graded to carry water away from the structure conditions are very favorable to decay.

Split logs and slabs are sometimes used in the manner shown in Figure 13; two layers of logs or slabs are used, with staggered joints and roll roofing or heavy building paper between. Edges of slabs should be cut to make close joints, *a*, and sill thickness should at least equal that of floor and quarter-round *b*.

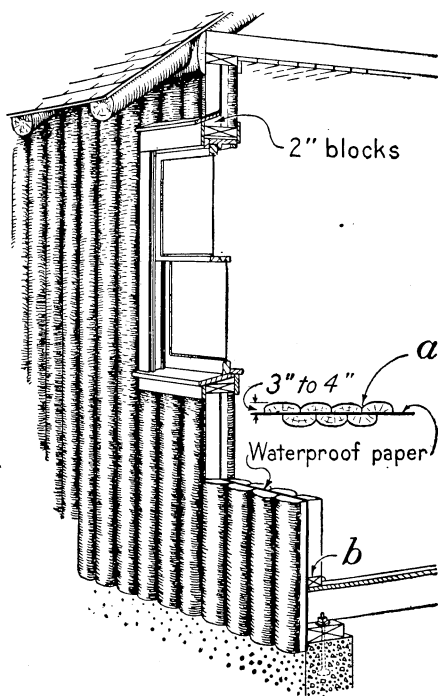
LOG HOUSES

There is nothing complicated in log-house construction. The main difficulty lies in the amount of heavy work necessary. After the general method of using logs and the type of joint have been decided upon, a sketch should be made from which the number and sizes of the various logs can be determined. Methods of building various details are outlined herein, and these can be varied to suit individual preferences or requirements. In general, details are similar to those used in frame construction; however, it is very important that the details afford protection against dampness which promotes decay. If wood is always kept dry there is little danger of decay; wetting by storms is not detrimental if the wood dries

out quickly and water does not collect in the joints and remain there. Wide eaves help to keep storm water away from the walls and foundation. Proper grading will drain surface water from the building. Figure 12 shows an example of a poorly graded building site. Joints at corners, around openings and between logs should be constructed and protected so that water cannot collect and remain in the wood. Foundations should be designed to keep logs off the ground and to afford a means of ventilating the underside of the floor.

FOUNDATIONS

The first consideration is a suitable foundation the character of which is determined by the degree of permanence required. So far as possible local stones should be used. If the house is to be occupied the year round, a full masonry wall is advisable; this may be of concrete or of stones laid in cement mortar. If there is no cellar under the structure, a number of screened holes about 4 inches wide and 8 inches high should be provided in the four sides of the foundation to ventilate the underside of the floors and thus reduce the danger of timbers rotting. Note the lack of ventilation openings in the shingle inclosure under the house in Figure 5. The foundation wall should be from 2 to 3 inches wider than the diameter of the logs, but in any case not less than 8 inches wide. The width of the footing, or bottom of the foundation wall, will depend upon the character of the soil. In general, if the footing is 8 inches wider than the wall thickness it should prevent settlement unless the soil is very soft. Local requirements can be ascertained by examining structures in the vicinity built on similar soils.



Method of framing small split logs or slabs vertically. (Method recommended by University of Wisconsin.)

The simplest support for temporary structures consists of large, flat stones laid on firm ground, and it is advisable to use two stones, one on top of the other. The top stone prevents ground moisture from rising by capillarity to the sill which is thus protected from rotting. If stones are not readily available and termites need not be guarded against, mud sills or heavy logs laid on the ground can be used for the foundation of temporary buildings. Wooden posts 10 to 12 inches in diameter are frequently used and should be of cedar, locust, or other durable wood unless creosoted. Instructions for creosoting are given in Farmers' Bulletin 744, The Preservative

Treatment of Farm Timbers. Posts should be set in the ground at least 3 feet with the lower ends resting on flat stones. They should be placed at the corners of the building and at points 5 to 10 feet apart under the walls and cross girders. Concrete and masonry piers are preferable because of their durability.

LAYING UP THE WALLS

The heaviest and best logs should be used for sills or bottom logs, and care should be taken to see that they bear firmly on the piers and do not rock. If the foundation is a continuous wall both the top and bottom of the sill logs should be hewn flat, but if the building is supported on piers only the upper surfaces and the bearings on the piers are flattened. Sills under cross walls should be halved into abutting sills and tree nailed or heavily spiked. Care should be taken to make the tops of all sills level. The notches in the ends of the wall logs should be of such depth that the logs are almost in contact. If they are not hewn flat, bends and knots should be trimmed to make a fairly tight fit. As the logs are notched and placed they should be fastened to the lower tiers at the corners with sixtypenny or longer spikes. A good method of fastening logs, especially when not notched at corners (fig. 9, upper left-hand sketch) is to bore $\frac{3}{4}$ -inch holes 3 or 4 feet apart, or closer if need be, in the upper side and half way through each log so that sixtypenny spikes, when driven into the holes, will penetrate the next lower tier. The holes should be staggered in alternate tiers to avoid driving the spikes into the holes of the lower logs. A $\frac{5}{8}$ -inch round iron punch is used for driving the spikes firmly into the bored holes. These spikes form a good anchorage for fastening the strips of metal lath recommended on page 10. To prevent one corner of the building from rising higher than another the butts and tops should alternate in direction, and as a precaution it is advisable to test the level of the wall at several stages before the top log or plate is reached.

OPENINGS IN WALLS

A common fault of log houses is that too little window area is provided, and consequently the interiors are dark and gloomy (fig. 14); the cost of obtaining plenty of interior light is money well spent. Casement windows are more in keeping with log construction than are double-hung sash, and these should open outward to exclude rain. (Fig. 8) This type of window is economical as it does not require much millwork or hardware. Where there are mosquitoes, screening will add much to comfort. Windows and doors can be installed as in ordinary frame structures after the opening is cut in the log wall.

When only long logs are used for the walls no attention is paid to the openings, except, where possible, to place a poor part of the log where it will eventually be cut out. However, when the top of a window or door is reached, the top log of the opening is cut out; thus provision is made for cutting out the full opening later. The next tier then forms the lintel. The openings can best be cut by means of a 2-man saw guided by a 2-inch vertical plank temporarily nailed

to the face of the wall. False jambs (2-inch plank from 4 to 10 inches wide and the full height of the opening) should be spiked to hold the ends of the logs. Before the opening is cut, the outside dimensions of the window frame should be determined. The opening should then be cut about 4 inches wider to allow for the false

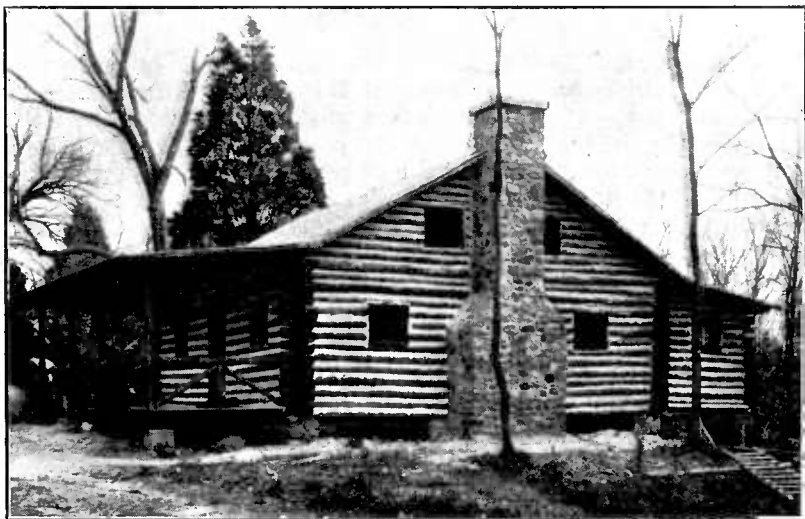


FIGURE 14.—The small windows detract materially from the appearance of this house and cause a dark interior

jamb. If sash is to be installed without frame, the opening should be 4 inches wider and longer than the sash. (Fig. 15.)

When short logs are employed for panels between openings, they should be cut to a length equal to the width of the panel, and held in place by false jambs. Care must be taken, however, to provide long logs which extend the whole length of the wall, or at least across several panels, at sill and lintel heights so that the wall will be securely tied together. A stronger panel is formed if the logs are tree nailed or otherwise fastened together as previously suggested. If short logs are used to build up the panels, considerable care and extra labor are required to bring the tops of the

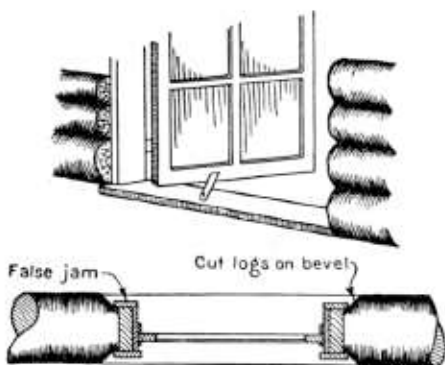


FIGURE 15.—Method of cutting logs for windows

panels to the same height and to preserve uniformity of texture of the wall surface.

INTERIOR FINISH

At best, much of the chinking has to be gone over during the second season, especially if the joints are wide. For this reason it is

advisable to defer the interior trimming until after settlement or shrinking has ceased. The method of finishing is a matter of personal preference. Rustic interiors with balconies, knee-braced posts, etc., are more suitable for recreation shelters than for farm dwellings. Sometimes the inside faces of the logs are left rounded, but when smooth interior walls are desired the inner face of the logs, as they are laid, should be hewn to a perpendicular line. Frequently dwellings are sheathed inside with tongue-and-groove lumber, and occasionally they are plastered.

Partitions may be of logs placed vertically, laid horizontally to intermember with the outside walls, or built of 2 by 4 inch sawed studs and covered as in ordinary house construction. Cheap partitions are made of poles, of two layers of slabs with the rounded faces exposed and staggered so as to cover cracks in each layer (fig. 16), or of wide boards with 1 by 2 inch battens on both sides to cover the cracks. Stairs can be made in the usual manner or as illustrated in Figure 16. Poles and slabs are sometimes used for the carriages and treads in building stairs, but plank treads as shown in Figure 3 are the more usual.

FLOORS

A good tongue-and-groove floor is recommended for all log dwellings. The floors of minor farm structures may be of clay and sand rammed hard, or of logs laid on the ground with the top surfaces hewn flat. Tongue-and-groove flooring may be laid on joists of logs spaced 2 feet or on joists of dimensioned lumber spaced 16 inches. Joist logs spaced 2 feet should be 6 inches in diameter for 12-foot spans, 8 inches for 16-foot spans, and 9 or 10 inches for 20-foot spans, and should have the upper face flattened to make an even surface for flooring. If dimensioned timbers 2 inches thick, spaced 16 inches, are used for joists, their depth should be 2 inches greater than the diameters given for logs of the different spans, unless they are of light, weak wood, in which case their depth should be 4 inches greater than the diameters given for joist logs. Sometimes joist logs are cambered in the center to compensate for sagging in which case about 2 inches should be allowed for 20-foot spans. Long spans should be avoided if possible because of vibration and the difficulty of allowing for sagging.

It is advisable to use seasoned or sound dead logs for joists, partition studs, stairs, etc. as seasoned wood is not so subject to checking and warping as is green timber. The joists should be framed into the sill logs before the wall logs above the floor level are laid. One method of doing this is shown in Figure 17, A, but this type of joint requires considerable skill and labor. Another and more usual method, in the less-pretentious houses, is to run the joists entirely through the walls (fig. 2) if there is a second story; this practice ties the walls together at the second story. When dimensioned lumber is used for joists the framing may be as shown in Figure 17, B.

ROOF

A gable roof is best suited to log construction. The ridge should be at a height above the plate of from one-quarter to one-half of the

span. The ridge can be kept straight and level more easily if a hewn or sawed 2-by-6-inch ridge board is used rather than a log, as such construction permits of rafters of uniform length and assures good alignment. (Fig. 18, A.) Two methods of framing rafters to the side walls are shown in Figure 18, B and C. Poles 4 to 6 inches



FIGURE 16.—An interesting method of framing a rustic partition; the Dutch door is unusual while the method of knee-bracing girders of long span is clearly shown

in diameter, depending upon the span, will serve for rafters. (Fig. 3.) Slabs can be used for sheathing by placing the sawed sides up and fitting the rounded sides to the rafters so as to secure a fairly smooth surface. If the sheathing is to be covered with composition roofing, the edges of the slabs should be trimmed so as to form tight joints;

but if the roofing is to be of wood shingles the slabs can be laid with small spaces between them, or 1 by 4 inch sawed strips spaced 6 inches on centers can be substituted.

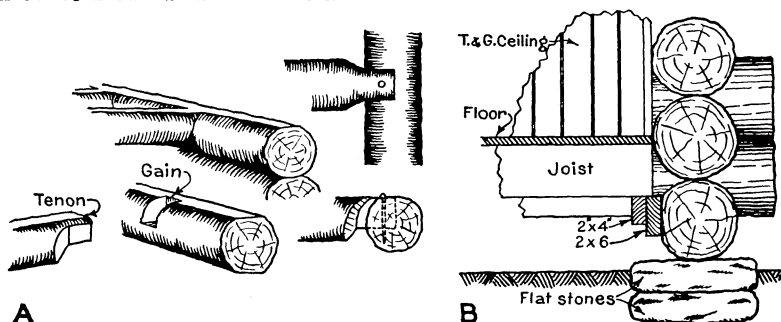


FIGURE 17.—A, a difficult yet very rigid joint between joist and sill; B, the floor level should be in line with the face of the wall log so as to form a tight joint

Sometimes poles are placed horizontally for the roof framing and membered with gable walls. Slabs or sawed sheathing may then be used as a base for the roofing, or if care is taken to place poles of uniform diameter fairly close together, the shingles can be laid without sheathing. (Fig. 19.) Shingles harmonize with log construction and should last from 10 to 15 years or longer if they are of good cedar or white pine. Spruce or hemlock shingles will also serve, but they are not as durable. To avoid leakage, all ridges, valleys, and hips should be covered before the shingles are laid, with strips of painted tin 16 inches wide. Chimneys or other projections through the roof should be flashed with the same material. Occasionally the roof is covered with two layers of slabs placed face to face (fig. 20) and laid so as to break joints, but such a roof is likely to leak if the slabs warp or open up, and this construction is suitable for only very temporary structures. Of course, other coverings besides shingles—such as tarred roofing, composition shingles, and corrugated sheet metal—can be used to advantage but at a sacrifice of appearance.

CHIMNEYS

Farmers' Bulletin 1649, Construction of Chimneys and Fireplaces, contains directions for building fireplaces and safe chimneys. In planning the structure, consideration should be given to the location of the

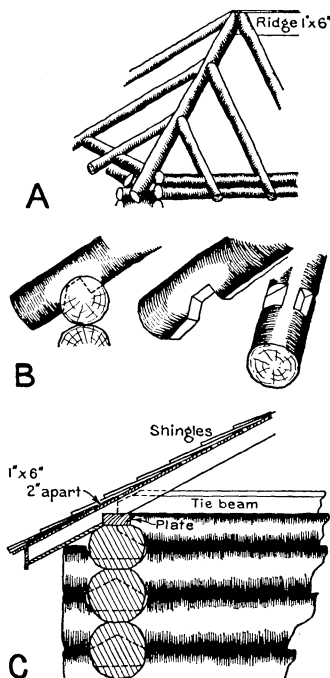


FIGURE 18.—A, a ridge board facilitates making a straight roof line; note that the hip rafters are larger than the common rafters; B, with this type of joint it is difficult to keep the eaves level; C, a good method of terminating the wall even though poles are used for rafter

chimney for if built into an interior wall openings can be provided for stovepipes from the various rooms, thus permitting the individual rooms to be heated. The chimney should be well built,



FIGURE 19.—Large shingles are placed directly on logs which alternate butt and point, no sheathing being used

especially if the log house is to be a home. Two or more flues can be built in the same chimney. The fireplace should be connected to a separate flue which should be not smaller than 8 by 12 inches; flues for



FIGURE 20.—Two layers of slabs placed with sawed faces in contact are unsatisfactory for a permanent roof and if used the roof pitch should be fairly steep

the stoves should be not less than 8 by 8 inches. Because of the protection from fire which they afford, all flues should have terra-cotta linings. The log chimney (fig. 21) while picturesque is a fire menace

and should be used only as a veneer for a properly built masonry stack. A chimney should be built on a foundation resting on solid ground and never on a shelf. The expense of the extra masonry is well warranted and is a good investment. A good draft can not be assured unless the chimney is at least 20 feet high.

Rubble masonry³ is considered very desirable for use in building the exposed parts of fireplaces (fig. 22) and the chimney proper because it blends with the rustic character of log construction better than brick or concrete. While masonry chimneys should always be used when practicable, there are times when expediency warrants the extension of a stovepipe through the roof. (Figs. 8 and 20.) When this is the case a hole 18 to 24 inches square should be cut through the roof and covered, on top of, and underneath the rafters, with sheet metal having a hole at the center equal to the diameter of the pipe.

PORCHES

Wide porches add considerable comfort to a house in the country as they can be used for work, rest, and entertaining throughout much of the year. The extra space thus provided costs less than like space incorporated in the house proper. Figure 23 shows how easily a porch can be obtained, while Figure 1 shows how extra room can be cheaply provided between the wings or sections of a house.

CONVENIENCES

Water and plumbing systems are essential features of modern homes. The fixtures need not be elaborate nor costly. Some of the simpler systems⁴ can be installed with a few tools.

COST

Very little information is available relative to the cost of log construction, but whether the builder of a log house be wealthy or poor he will find it economical to hire woodsmen rather than carpenters to hew and handle the heavy logs. Men of considerable experience with house construction are sometimes amazed at the high cost of log houses erected by workmen who, though skilled in ordinary house building, are unfamiliar with the technique of log construction. On the other hand, many pioneers built homes of logs at small cost which stood long enough to serve several generations. It is the usual experience of those who build their first log house with hired help that the amount and cost of labor necessary is somewhat greater than would have been required if dimensioned lumber had been used. The builder of the house shown in Figure 4 estimated that, even though the logs were cut on the site, the walls cost 50 per cent more than they would have cost had he used 2 by 4 inch stud

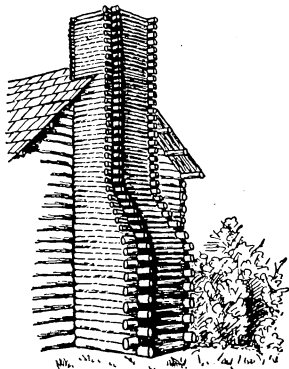


FIGURE 21.—A dangerous type of chimney

³ Instructions for the use of field stones in rubble masonry can be had from the Bureau of Agricultural Engineering, Washington, D. C.

⁴ See Farmers' Bulletin 1227, Sewage and Sewerage of Farm Homes; Farmers' Bulletin 1426, Farm Plumbing; Farmers' Bulletin 1448, Farmstead Water Supply.



FIGURE 22.—A well-built stone chimney, exterior shown in Figure 4. The exposed logs make a very pleasing interior



FIGURE 23.—A wide porch

walls. However, he was put to extra expense for scrubbing the logs with wet sand to remove blue mold or mildew that formed upon them, and he was very careful in executing all details.

OTHER USES OF LOGS

The principles outlined for the construction of log houses can readily be applied to the building of other types of farm structures and equipment. A serviceable barn can be had by covering a pole frame with slabs. (Fig. 24.) While the roof may be entirely of slabs, as shown, it is best to use only one layer with the sawed faces up to serve as sheathing for prepared roofing or other covering. The slabs should be trimmed at the edges to permit their being laid close together.



FIGURE 24.—Particular emphasis is made here on the necessity of ample light since too frequently barns, especially when built of logs, do not have a sufficient number of windows to assure a healthful interior for stock

Pole construction may be employed in the erection of buildings for various other purposes. An excellent example of such construction is shown in Figure 25.

Logs are used extensively for building culverts (fig. 26), bridges (fig. 27), causeways (fig. 28), and cattle cross unders beneath highways (fig. 29). Such structures should be built of durable species. Figure 30 illustrates a convenient table with benches attached, suitable for outdoor use. Figure 31 shows a good method of protecting haystacks in the field, while an easily built hay feed rack is illustrated in Figure 32.

Poles of 2-inch diameter can be used for ornamental paneled fences, stock pens, gates, and stiles (see footnote 4, p. 19), or for light and easily built fences such as shown in Figure 33.

Logs 8 inches or larger in diameter can be used for the superstructure of an ice house and, if it is partly below ground, for lining the pit when the soil will not stand without support. If the walls are of heavy logs and they are well chinked, no insulation should be required other than the 2 feet of sawdust for packing between the

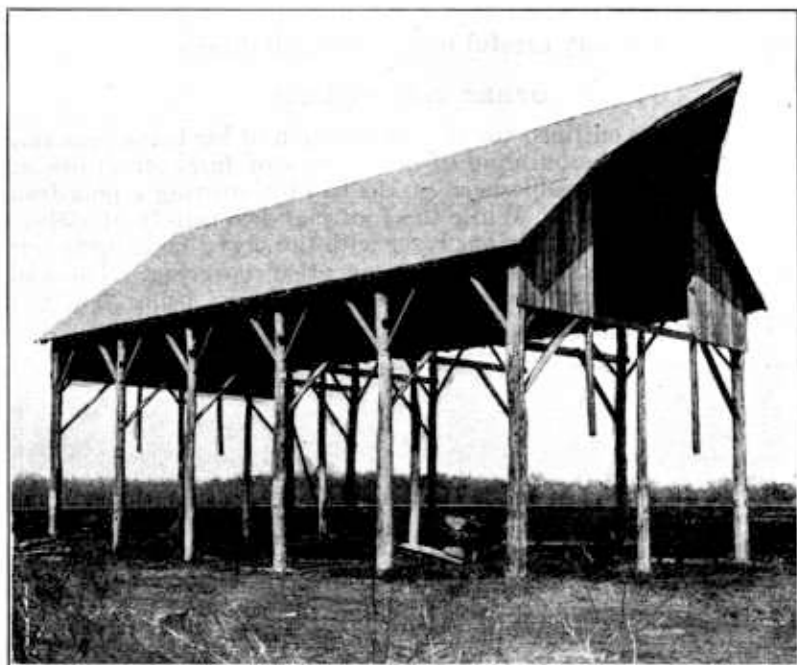


FIGURE 25.—Hay shed 24 by 60 feet; posts are 12-inch logs 25 feet long. The roof could well be of slabs and these could be used to close in the sides. Knee braces of 5-inch and girders of 10-inch diameter logs could be used instead of the dimensioned lumber

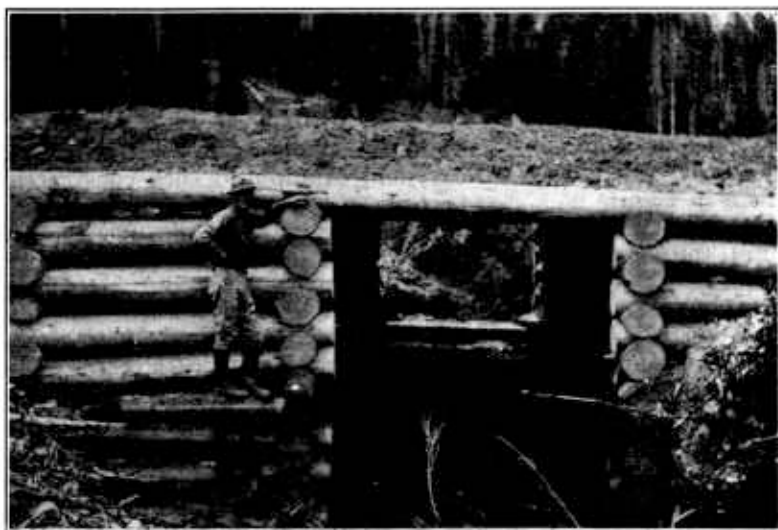


FIGURE 26.—A 10 by 6 foot log culvert. The span and height can be varied to suit local needs

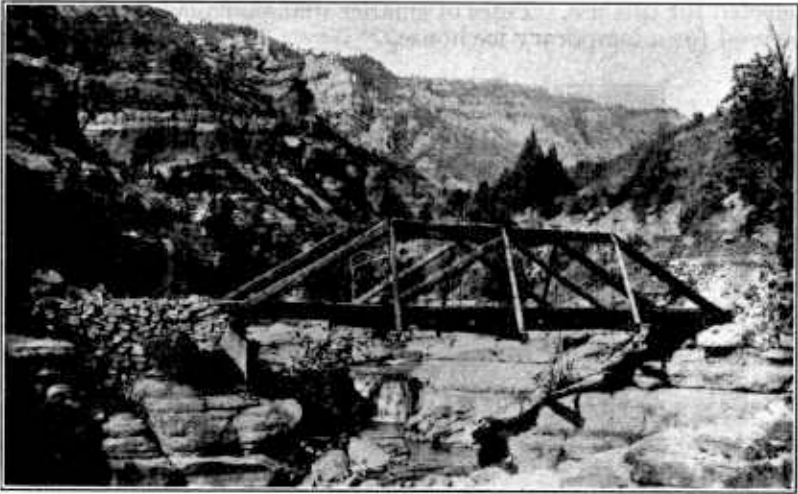


FIGURE 27.—A log bridge of 40-foot span. Such a structure can not be built by an amateur



FIGURE 28.—Bridge suitable for crossing a swamp or shallow stream. The piers, 20 to 30 feet apart, are built up of cribbed logs

inside wall surface and the ice. Logs of a durable species should be selected for this use. Poles of smaller diameter placed vertically can be used for a temporary ice house.



FIGURE 29.—Method of constructing culvert-bridge spans of 12 to 20 feet. The cribbed buttresses reduce the span and form secure rests for the bridge. Cross unders to enable cattle to pass between fields each side of the road can be built in this manner. Note the method of protecting the road from erosion

The Department of Agriculture has published a number of bulletins and prepared several drawings describing the use of logs for various purposes. These are listed below:

Farmers Bulletin 847, *Potato Storage and Storage Houses*; describes in detail a cellar of logs and gives the requirements for storing potatoes.

Farmers' Bulletin 1738, *Farmhouse Plans*, contains plans for one house of logs and for other houses that could easily be adapted to log construction.

Department of Agriculture Yearbook Separate 1036, *Road-Work on Farm Outlets Needs Skill and Right Equipment*; Figure 201 shows a typical design of a split-log road drag.

Farmers' Bulletin 1487, *Practical Hog Houses*; Figure 9 shows a hog shelter of logs and brush.

Drawings Nos. 1247, 1625, and 2086 illustrate logrollers, floodgates, and a haystacker, respectively. Blue prints of these designs and instructions for using wooden fence posts may be had from the Bureau of Agricultural Engineering, Washington, D. C.



FIGURE 30.—A convenient type of table, tipped to show its construction. Note that the tops of the logs of the table and the benches are hewn flat

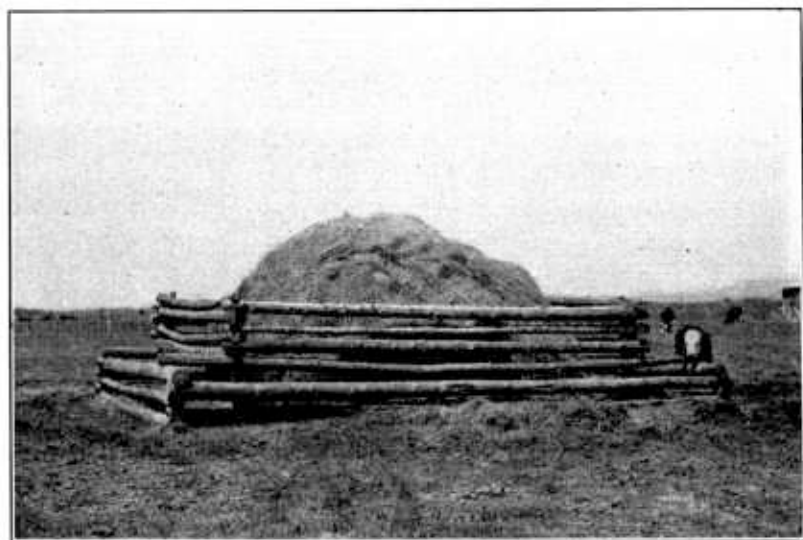


FIGURE 31.—Method of protecting stacks from cattle; note the feed troughs on two sides

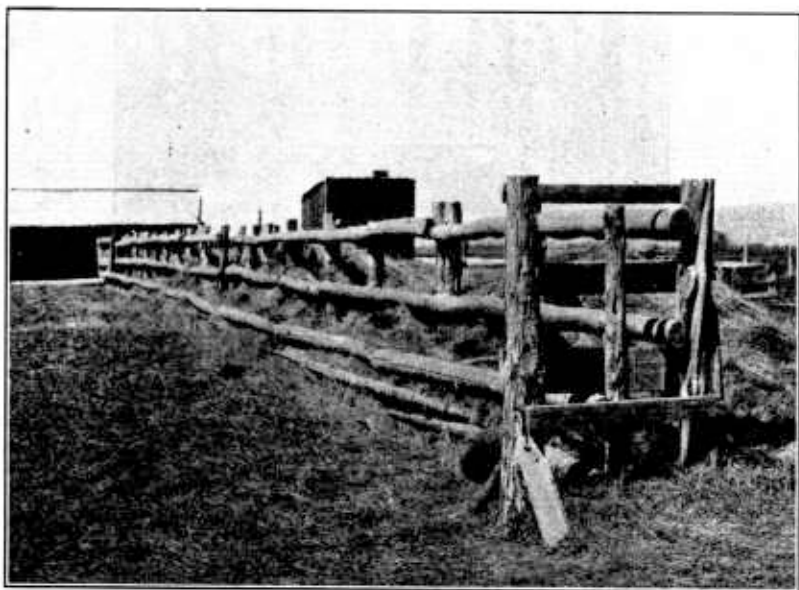


FIGURE 32.—A feed-lot hay rack, rather wasteful of hay, but more economical than feeding from the stack and suitable for temporary use



FIGURE 33.—A supports of 3-inch poles, 8 to 10 feet apart, stuck in the ground 18 inches and nailed or wired at the apex. The top rail, a $1\frac{1}{2}$ to 2 inch pole, is fastened in the crotch and the bottom rail is nailed to the frame. Three or four rails could be used, depending upon the desired tightness of the fence

U. S. GOVERNMENT PRINTING OFFICE: 1935